GEO
Guyana Economic Opportunities

Postharvest Handling Analysis of Fresh Produce and Recommendations for Improving the New Guyana Marketing Corporation Packinghouse

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Table of Contents

Executive Summary

This report provides an analysis of the postharvest handling practices used for fresh produce in Guyana, with emphasis focused on ways to improve the New Guyanese Marketing Corporation (NGMC) packinghouse. It is intended to offer guidance and practical recommendations to the GEO Project and NGMC in their efforts to improve the operations of the NGMC packinghouse and increase exports of fresh produce from Guyana. A number of simple and practical improvements are needed in the NGMC packinghouse operations to improve efficiency of product flow and postharvest quality. In addition, technical assistance and training materials on appropriate postharvest handling practices for specific export crops should be provided to growers, collectors, exporters, and agriculture extension personnel. Demonstrations and training sessions involving simple and effective technologies to improve product postharvest life and market quality are also needed.

Considerable opportunity exists to increase the export volume of Guyanese fresh fruits and vegetables. Markets in Barbados, Antigua, Toronto, and New York are currently being serviced with Guyanese product, albeit in small volumes. However, the majority of Guyanese product is sub-standard against international competition. This can be attributed to numerous factors, including rough product handling after harvest, inadequate postharvest sanitation and concomitant postharvest decay, weak and unattractive packaging, and an absence of cooling and proper temperature management after harvest. With improved product quality and consistency, significant expansion in Guyanese export volume is possible. In order for Guyanese produce exporters to expand their volumes and develop a sustainable export industry, it will be necessary to make improvements in many aspects of product postharvest handling and packaging. International buyers insist on consistent supplies of high quality product.

An obvious problem which contributes to a reduction in the arrival quality of Guyanese fresh produce is bruising injury caused by rough handling. The result is product damage, surface discoloration, and increased and more rapid postharvest decay. Rough handling was observed during movement of the product from the farm to the purchase site of the buyer/collector, during off-loading of the product at the NGMC packinghouse, during packing, during the loading process onto the truck destined to the airport, and during unloading of the truck and loading of the cargo on to the airplane at Cheddi Jagan International Airport. A concerted effort is needed to educate fresh produce handlers on the importance of handling the product gently like eggs, instead of like hardware. This should be supplemented with strict supervision of the workers to ensure the product and cartons are treated gently.

Inadequate postharvest sanitation practices at the NGMC packinghouse contribute to product deterioration and postharvest decay. Both Barbados and Antigua require all fresh produce imports into their countries be washed at the NGMC packinghouse. The produce arrives at the packinghouse dirty, and must be scrub-brushed in water. In some cases, diseased product is mixed in with healthy items in the same wash water tank. This results in contamination of the wash water with bacteria and/or fungal spores which can spread to healthy fruit or enter injured sites on the product

surface and cause decay. Utilization of the appropriate amount of chlorine in the wash water (i.e. 150 ppm) along with maintenance of the water pH between 6.5 to 7.0 will significantly reduce the spread of disease and reduce problems with postharvest decay. Three out of the four exporters using the NGMC packinghouse did not add chlorine to the wash water. In the case of the sole exporter who added chlorine, there was no awareness of the appropriate concentration to use or how to monitor the concentration and measure the pH of the water. The current washing practice at the NGMC packinghouse is probably doing more harm than good.

The cartons currently being used in Guyana for fresh produce are not conducive for preserving product quality. The cartons are structurally very weak, thin, not ventilated, and subject to collapse. The stock material used to make the cartons is recycled cardboard, which gives a significantly weaker carton compared to virgin paper stock. Also, the majority of cartons used by exporters have a thickness of only a single ply, which cannot support stack heights of more than several cartons without collapsing. This becomes evident immediately after packing and continues to get worse during the movement of the cartons from the NGMC packinghouse to the airport and beyond. This results in fruit compression bruising, reduction in appearance of the external surface of the product, and accelerated postharvest decay. The export markets in the U.S., U.K., and Canada require the produce to be packed in strong cartons capable of withstanding the rigors of the wholesale and retail market distribution system. Guyanese exporters must meet the packaging strength and design expectations of importers.

Almost without exception, fresh produce in Guyana is not cooled after harvest. Even among produce exporters, there is no effort placed on keeping the product cool after harvest, after packing, or during transport. The ideal postharvest holding temperature for the vast majority of fruits and vegetables exported from Guyana is around 55°F (12.5°C). Storage of the fresh produce items at ambient temperatures (typically between 75°-85°F) results in an accelerated rate of ripening, softening, and postharvest decay. The negative consequences of inappropriate postharvest storage temperature were observable as quickly as the following morning after washing the product. Overnight fungal decay on the butt end of washed Montserrat pineapples amounted to a 20% loss in export volume for one exporter. Appropriate postharvest temperature management is currently lacking in Guyana, but represents the single-most important factor for extending the market life of any commodity.

Many inefficiencies exist in product flow and infrastructure at the NGMC packinghouse. Specific recommendations are included in this report on how to improve product handling, sanitation, packaging, and postharvest temperature management. Cost estimates are provided for each of the suggested improvements.

Purpose

In late 2001 the Guyana Export Opportunities (GEO) Project developed a Small and Micro Enterprise (SME) Sector Assistance Program that focused on stimulating and supporting the development of the SME sector in Guyana. Subsequently, the GEO Project developed a Near-Term SME Export Action Plan which focuses on identifying export market opportunities and creating market linkages for SME exporters. This Action Plan includes components to develop market linkages, market information, and export-related policy and regulatory reform. Initial efforts under this Action Plan have included a survey of Guyanese SME firms and their products, and a market survey targeting the Guyanese expatriate communities in Toronto and New York City. These surveys confirmed that the domestic market for SME's is highly competitive, and that there may be considerable opportunity for SME exporters to sell more specialty Guyanese products to the niche Guyanese markets in North America.

The surveys also identified a number of immediate, practical constraints to increasing SME exports, including:

- lack of knowledge among SME's about the requirements and demands of exporting;
- insufficient contacts and information about international buyers;
- minimal information on export opportunities in the Caribbean market;
- difficulties with packaging and labeling;
- lack of specific information on import requirements in the U.S. and Canada;
- absence of cold storage and packing facilities near the airport;
- problems with transportation, particularly limited air cargo capacity for shipping fresh produce.

Concerning packing facilities, Guyana has protocols with Barbados and Antigua that mandate the packinghouse run by the New Guyana Marketing Corporation (NGMC) is to be the sole facility through which Guyanese fresh fruits and vegetables may be exported to those two countries. Previously, Barbadian agriculture inspectors came to Guyana weekly to inspect the produce, but now have accepted Guyana's controls and are conducting inspections only in Barbados. Producers and exporters to other countries may use the NGMC facility, but in most instances use their own facilities. It is a concern of the NGMC, the Ministry of Agriculture, and others, that Guyanese exports meet the existing and any planned future standards for handling, packaging, and storage of fresh produce for export. The goal is to maintain a favorable reputation and ensure the quality of Guyanese products. The private and public sector stakeholders in the NGMC packinghouse have also expressed concern about the adequacy of the existing facilities.

Approach

The focus of the GEO's SME assistance program is on identifying market opportunities and creating market linkages for SME exporters. The consultant undertaking the current work assignment will concentrate on delivering specific, practical recommendations that may contribute directly to

enhancing the export environment in Guyana and/or increasing opportunities for Guyanese SME's to export. The consultant will review the Near-Term SME Export Action Plan, results of recent reports on the Guyana SME sector and international marketing surveys, and participate in presentations and discussions on his findings to public and private sector stakeholders. He will develop specific, practical recommendations and actions to follow in order to improve the quality and export market opportunities for Guyanese fresh produce. In addition, he will propose future interventions and follow-up work in order to stimulate fruit and vegetable exports.

The consultant will work closely with key partners to the SME assistance program and SME Export Action Plan, such as: Go-Invest, NGMC, Association of Regional Chambers of Commerce, Institute of Private Enterprise Development, and Guyana Marketing Association to ensure effective and widespread outreach, promotion, and information dissemination. The consultant may also work with other Guyanese public and private organizations and donor-supported programs, as appropriate, for technical expertise on specific issues and products. These may include the Ministries of Fisheries, Crops and Livestock; the Guyana National Bureau of Standards, and other organizations working with SME's.

Purpose of Assignment

The purpose of the assignment is to assist in a feasibility analysis for upgrading packing and storage facilities for fruit and vegetables in Guyana to meet the needs and requirements for export markets.

Specific Tasks

With respect to the major fruit and vegetable export crops in Guyana, the consultant will:

- assess the current policies, systems, and procedures in use at the NGMC packinghouse;
- interview key government agencies and officials responsible for the organization and management of the packinghouse to identify their concerns, issues, and needs;
- interview the leading private sector exporters currently using the packinghouse facilities to identify their concerns, issues, and needs;
- assess the quality of the postharvest handling, packing, and storage of the various key fresh fruits and vegetables being exported from this facility;
- propose measures that may be implemented immediately and at low cost to improve operations in the existing packinghouse;
- recommend alternative solutions to the existing packinghouse, including a description of their technical, organizational, and financial feasibility, and timing for implementation;
- assess available versus alternative packing facilities and processes in terms of enhancing effectiveness and efficiency;
- quantify the cost of each alternative packing facility and process;
- lead an informal workshop with government officials and private sector exporters to address the key issues and identify possible solutions.

Specific Task Findings and Analyses

1. Assessment of the current policies in use at the NGMC packinghouse

The NGMC packinghouse is located in Sophia (Georgetown), inside the International Exposition Center complex. It was obtained by the government in order to facilitate exports of Guyanese produce to Barbados and Antigua. Government officials from these two countries approved it as an acceptable facility for the consolidation, preparation, and packing of Guyanese produce to their countries. Prior to this, plant health officials from Barbados came to Guyana weekly (until March 2002) to inspect the produce and growing sites for phytosanitary conditions. In October, 2000 the NGMC packinghouse was approved by officials from Barbados as the only acceptable consolidation and packing site for Guyanese produce exports to their country. The principal concern of the Barbadians was to prevent the introduction of the pink mealybug from Guyana into Barbados. This is a noxious insect pest currently not present in Barbados, which would threaten domestic agriculture production if it became established. The weekly inspection visits were costly (approximately $600 per trip) and the expense was levied on the exporters. However, it was the only acceptable procedure for allowing Guyanese exports into Barbados. In fact, Barbados stopped all imports of Guyanese fresh produce for several years (1997-1999) as a quarantine measure in response to pink mealybug being found in Guyana. Guyanese exports to Barbados were allowed to continue in 1999, under the supervised inspection procedure. Inspectors from the Guyana Ministry of Agriculture (Plant Health Unit) must now certify all exports, according to a protocol established by the Barbadians. In addition, all produce exported must come from Plant Health Unit certified farms in Regions 2,3,4,5, and 6 of the country. Currently, Guyana exports slightly over 200,000 pounds per month of fresh produce to Barbados. The principal export items include plantain, pineapple, pumpkin, limes, oranges, watermelon, eddoes, pear (avocado), bora, passion fruit, cucumbers, cassava, and eggplant. Produce exports to Antigua were suspended for a longer time period, only being allowed to resume in May, 2002.

The NGMC packinghouse building in Sophia was not originally designed for that purpose. The un-used building was recently taken over by the NGMC and partially retrofitted to serve as a packinghouse. Modifications included partial roof repair, addition of wooden flooring, installation of more inside lighting, and general cleaning. In addition, several weighing scales, portable wash tanks, drying and sorting tables, and movable fans were added to make the packinghouse operations flow more efficiently. General building cleaning is done several times a week.

There are approximately __ exporters of fresh fruit and vegetables in Guyana. It is the policy of the NGMC to allow the use of this facility to all produce exporters. Currently, there are 4 active exporters using the facility; 3 for the Barbados market and 1 for Antigua. Several additional exporters either have either used the facility in the past and are now inactive, or have expressed interest in future use. There are also several more exporters who send product to Canada who do not use the facility, but with appropriate modifications may be enticed to use it in the future. Each exporter is charged a $G2000 per week user fee, which is used to pay the salary of the person in charge of building cleaning. No additional charge is levied on the exporters for use of the facility.

In addition to the building, the NGMC coordinates the presence of several Ministry of Agriculture plant health inspectors for certification of the produce in accordance with the phytosanitary protocol required by Barbados and Antigua. The exporters are not charged for the services of the inspectors.

The exporters can use the packinghouse facilities at any time and are provided minimal office space. They can also use available space for temporary carton storage. A bathroom and a small eating area are also available for exporters and their workers.

2. Interviews with government officials concerning the NGMC packinghouse

Interviews were conducted with a number of key government officials and NGMC packinghouse personnel to obtain their feedback on the important concerns, issues, and needs of the packinghouse. A list of the public sector individuals interviewed is included in Appendix A. Everyone expressed concerns about the current inadequacy of the building as a packinghouse and its many limitations. The location of the facility was also considered less than ideal. However, it was also recognized this building is the only likely option for a NGMC-run packinghouse facility for the next several years. Government funds are just not available for construction of a new packinghouse. Therefore, the issue is to determine how to best spend limited funds on improving the existing facility. Another concern was how to recover the costs of infrastructure improvements. Most public sector officials did not think the private exporters would be willing to pay more for use of the facility, even if improvements were made.

Specific improvement needs for the packinghouse that were expressed by one or more individuals included:

- too much congestion in the unloading area
- better utilization of inside space
- better inside lighting
- more ventilation
- repair of leaks in the roof
- more washing areas
- uniform floor level

3. Interviews with exporters concerning the NGMC packinghouse

Interviews were conducted with all 4 of the exporters currently using the NGMC packinghouse for exports to the Caribbean. Three of the exporters are supplying product to the Barbados market and one is sending product to Antigua. In addition to the principals, a number support workers affiliated with the exporters were interviewed while working in the packinghouse to obtain feedback on their important concerns, issues, and needs. A list of the private sector exporters interviewed is included in Appendix A.

The private sector individuals voiced a great deal of concern about the adequacy of the packinghouse and offered numerous suggestions for needed improvements.

Specific improvement needs for the packinghouse that were expressed by one or more export personnel included:

- more space for product unloading and cleaning
- building access for unloading more than one truck at a time
- less congestion inside the packinghouse on Monday afternoons
- more space for washing
- continuous availability of water supply during the early afternoon hours
- drying tables that do not collect water
- more fans for drying the produce after washing
- more inside lighting
- availability of plant quarantine inspectors after 5 p.m.
- more space for storage of empty containers
- more space for storage of packed containers
- repair of leaks in the roof
- uniform floor level
- more accommodating office room for exporters
- more accommodating dining area

The exporters were asked if they would be willing to pay more for use of the facility if significant improvements were made. Contrary to the belief of many public sector officials, all the exporters indicated they would be willing to pay more. The amount of fee increase acceptable to the exporter would be based on the specific types of improvements made and their impact on improving packinghouse operations and product quality.

4. Assessment of the postharvest practices used for fresh produce exports

A range in quality exists in Guyanese produce. However, the majority of product is sub-standard against international competition (Figure 1). This can be attributed to numerous reasons, including poor harvesting practices, improper harvest containers, rough product handling after harvest, inadequate postharvest sanitation and concomitant postharvest decay, weak and unattractive packaging, and an absence of maintaining a cool chain after harvest.

Figure 1. Local market sweetpotato quality (left) versus international market quality (right).

A. Poor harvesting practices

The manner in which produce items are picked and the stage of harvest maturity directly impacts product quality and market life. It is a well established fact that the highest amounts of bruise damage during picking occurs when product pulp temperatures are at their highest. The worst possible scenario for harvesting is to pick the product in the heat of the afternoon and handle it roughly. Unfortunately, this was observed with a number of crops during the field visits to Parika and the Pomeroon river production areas. It is very important to keep the product as cool as possible after harvest, as high pulp temperatures result in accelerated rates of ripening and deterioration and reduced market life.

B. Improper harvest containers

The type of harvest container directly affects the amount of bruise damage imparted to the commodity. Containers that have rough inside surfaces will result in high amounts of product scarring and surface abrasions (Figure 2). Harvest containers made out of reed, dried palm fronds, and unfinished wood are widely used in Guyana and are particularly injurious to the delicate external surfaces of the fruit or vegetable.

Figure 2. Typical harvest basket with rough internal surface.

When stacked, the container itself should bear the weight load and not the contents inside. Particularly weak and damaging harvest containers are nylon or mesh bags. These are commonly used in Guyana for harvesting many different produce items, but afford the lowest levels of product protection and result in some of the highest amounts of bruise damage (Figure 3).

Figure 3. Mesh bag packaging used for cassava and eddoe.

The rigid plastic container is used sparingly in Guyana due to the higher cost, but in the long run is very durable, protective, and cost effective (Figure 4).

Figure 4. Durable smooth plastic field container for carambola.

C. Rough product handling

An obvious problem which contributes to a reduction in the export market arrival quality of Guyanese fresh produce is bruising injury and physical damage caused by rough handling. Rough handling was observed during movement of the product from the farm to the purchase site of the buyer/collector, during off-loading of the product, at the NGMC packinghouse, during packing, during the loading process onto the truck destined to the airport, and during unloading of the truck and loading of the cargo on to the airplane at Cheddi Jagan International Airport (Figures 5-9). The end result is the creation of open wounds, cracks, or tears on the surface of the commodity. These damaged areas serve as entrance points to bacterial and fungal pathogens that are ever present in the surrounding environment. Surface discoloration and postharvest decay ensue.

Figure 5. Rough handling of pineapple after harvest.

Figure 6. Rough handling of plantain at collection site.

Figure 7. Bruising injury to banana skin during ferry unloading.

Figure 8. Skinning of watermelon fruit from rough handling.

Figure 9. Abusive transport conditions result in significant damage to produce.

D. Inadequate postharvest sanitation

Inadequate postharvest sanitation practices at the NGMC packinghouse contribute to product deterioration and postharvest decay. Phytosanitary regulations of Barbados and Antigua require all Guyanese produce be washed at the NGMC packinghouse prior to export. The produce arrives at the packinghouse dirty, and must be scrub-brushed in water. In some cases, diseased product is mixed in with the healthy items in the same wash water tank. This results in contamination of the wash water with bacteria and/or fungal spores which can spread onto healthy fruit or enter injured sites on the product surface and cause decay. It may be difficult to see the decay, as the item may be contaminated by dormant spores of micro-organisms waiting to germinate and begin the decay process. This is the common situation in Guyana with postharvest anthracnose fungal decay of mangoes and stem end rot of pineapples.

Utilization of properly sanitized wash water containing the appropriate chlorine concentration and water pH will significantly reduce the spread of disease and reduce problems with postharvest decay. Unfortunately, the wash water used in the NGMC packinghouse during preparation of the produce for Barbados was not properly sanitized, and in all likelihood was causing more harm than good. Significant amounts of mold and stem end rot were visible on Montserrat pineapples the morning after washing (Figure 10). This is an indication of the lack of properly sanitized wash water. In fact, one exporter had to remove about 20% of his product from being exported. If this level of postharvest decay was apparent as quickly as the morning after packing, one can only surmise that the amount of postharvest decay several days later in Barbados will be even higher. Observations made during washing revealed that 3 out of the 4 exporters who used the NGMC packinghouse did not add chlorine to the wash water. In the case of the sole exporter who added chlorine, there was no awareness of the appropriate concentration to use or how to monitor the concentration and measure the pH of the water.

Figure 10. Mold growth on basal end of pineapples due to inadequate sanitation.

After the produce is washed it is placed on top of open metal or solid metal tables to dry. Most produce items are stacked on top of each other several or more layers high. This is necessary because of the limitation in table space for drying. However, this stacking arrangement causes product bruising and skin/peel injuries which negatively impact the export market quality of the product. This was particularly evident with plantains. In addition, the tables covered with solid metal do not have openings for run-off water drainage. Many of the table tops have sunken areas which collect water and serve as ideal microenvironments for postharvest disease organisms. Produce left on these tables overnight may be in continuous contact with contaminated water, which may result in accelerated postharvest decay.

E. Weak and unattractive packaging

One of the obvious deficiencies in the exportation of perishables from Guyana is the utilization of inferior packaging materials. Commonly used packages include nylon or mesh bags, reed baskets, and single-ply cartons made out of recycled cardboard stock. The packages are generally very weak structurally, not properly ventilated, and unattractive. They do not do an adequate job of protecting the product inside. Significant product damage occurs in transit due to the lack of stacking strength and collapse of the packages. Collapse of some of the cartons was noticeable immediately after packing. The carton corners are not reinforced and the strength and thickness of the cardboard stock is not adequate to withstand the normal abuses received during product loading and unloading in the distribution system. Upon arrival at the Amerijet cargo facility at Cheddi Jagan International Airport, about 35% of the cartons used by one exporter were visibly collapsed (Figure 11). After unloading in Barbados, the amount carton collapse and damaged product would be expected to only increase. The weak packaging materials also do not facilitate orderly marketing of the product at the export destination. When the contents inside collapsed packages have to be re-packed into stronger, stackable containers, this takes time and costs money and is something importers abhor. Using stronger packaging materials will reduce the likelihood of

damage claims and discounted loads upon arrival in the export market destination. Importers give preference to those suppliers who can provide high quality product packaged in the strongest containers. It is counterproductive to export any product in structurally weak packages.

Figure 11. Weak and collapsed packaging after arrival at air cargo facility.

Most of the packages used for export are not properly ventilated. Fresh produce remains alive after harvest and continuously gives off heat as a natural product of respiration. This heat generated from product respiration continues to increase inside unventilated sealed cartons, resulting in rapid rates of ripening, softening, and deterioration. A rule of thumb for fresh produce packaging is to have at least 5% of the external side/end surface area of the package with ventilation openings. The cardboard cartons and nylon bags had almost no ventilation openings. In an attempt to increase carton ventilation, all exporters used a large knife to punch openings in the cartons (Figure 12). This resulted in a very unattractive, beat-up package that still didn't facilitate adequate ventilation. The first impression one gets after seeing this type of carton is not positive. Most importers would have serious reservations about receiving product in this type of carton. What makes matters worse, the logo 'Quality Produce of Guyana' is written on the carton (Figure 13). Among produce importers, the attractiveness (or lack thereof) and quality of the carton always influences the perception of the quality of the contents inside. Stronger, better ventilated, and more attractive packaging will be needed in order for Guyanese exporters to increase their presence in the export market (Figure 14).

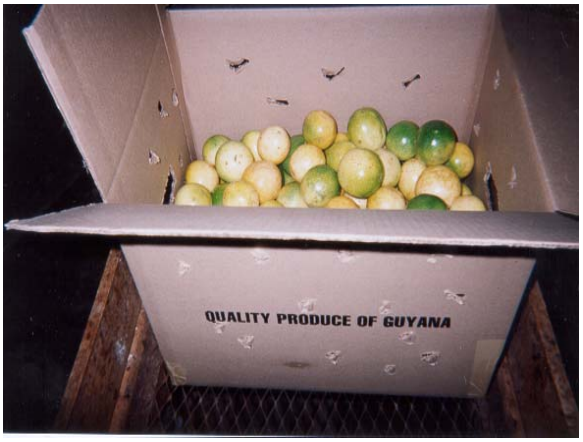

Figure 12. Unattractive manually vented carton.

Figure 13. Weak and inadequately ventilated export cartons.

Figure 14. Collapsed single ply cartons stacked on air cargo pallet.

F. Lack of cooling and temperature management

Proper temperature management is the single-most important factor influencing postharvest life and market quality of all horticultural crops. The rate of product deterioration is directly correlated to the postharvest holding temperature, with the higher the temperature the faster the rate of deterioration. Maintaining the product at high (i.e. > 75°F) temperatures for several days will result in accelerated ripening, wilting, deterioration, postharvest decay, and a loss in market quality. (Tropical root/tuber crops are the only exception, as they should be cured after harvest). A general rule of thumb is that a product loses 10 hours of potential shelf life for every hour it remains at field temperature (i.e. > 75°F) after harvesting. Postharvest cooling is essentially absent among all fruit and vegetable growers, collectors, and exporters in Guyana. In addition, the NGMC packinghouse does not have any cool room for holding produce at temperatures below ambient.

It normally takes at least several days for Guyanese fruit/vegetable products to be transported from the growing or packing location to the final port of entry in the international marketplace. At ambient temperatures the processes of ripening, softening, and deterioration continue unabated and at a high rate. The result is less than optimal product quality upon arrival at the destination market, and in many cases rejected or downgraded loads. Consequently, considerable market share is lost and significant economic losses may be suffered by the exporter. Many Guyanese do not understand that export markets require extremely high quality product, much better than found in most domestic markets. Importers demand and expect a consistent supply of high quality product. Postharvest cooling and temperature management is necessary to maintain export market quality of the fresh product and an acceptable shelf-life. In order to develop a more sustainable and profitable export horticulture industry in Guyana, a continuous effort is needed to convince the grower/collector/exporter that investment in cooling and storage infrastructure is as important as any other aspect of the business. Investments to save the marketability of fruits and vegetables after

harvest are not expenses. They will pay for themselves many times over. Even a partial reduction in postharvest losses can significantly improve the grower's net return. The axiom, "one must spend money to make money" rings ever so true in the perishables business. However, for many limited resource growers, the investment does not seem justified because of the small volume of product harvested. On the other hand, the volume of fresh produce packed for Barbados and stored overnight at the NGMC packinghouse is collectively large enough to justify the shared investment in a cool storage area.

G. Transportation constraints

Overstuffing and improper loading of produce in the transport vehicles is a common problem in Guyana. The result is significant product bruising and mechanical injury. In many cases, the raw product is transported in bulk in the bed of the truck and suffers a high amount of impact injury. Transport of product in wooden or rigid containers afford considerable more protection. Proper product loading patterns and stacking arrangements are generally not followed. Compounding the transportation problem is the lack of road accessibility to some of the production areas. Also, there is a lack of protected storage structures at the loading or consolidation points. Perishable products are often left exposed to the sun and elements for extended periods of time prior to arrival of the transport vehicle. This is not conducive to maintenance of product quality.

Essentially the entire export volume of perishable fruits and vegetables from Guyana is being transported by air. A combination of cargo and passenger planes is being used. Cargo space is currently adequate to meet the space needs of the exporters. However, air freight rates, reliability of service, and export market destinations differ among carriers. The vast majority of product destined for Barbados uses the Amerijet flight on Tuesday. Product for Antigua is typically sent on the BWIA flight on Friday. Product destined to Toronto is generally sent on the Amerijet flight on Tuesday. It is off-loaded in New York and trucked to Toronto. A direct non-stop weekly flight to Toronto is expected to begin in late July by Universal Airlines. Product destined to New York also uses the Amerijet service on Friday.

Sea freight service for perishables is available from Georgetown to different Caribbean and North American destinations on several different container lines. However, sailing times tend to be long and no direct service exists from Georgetown to North American destinations. All containers must be off-loaded and transferred on to another vessel in Trinidad or Jamaica, depending on the shipping line. Standard 40-foot refrigerated containers are available from all shipping lines. However, the smaller 20-foot container is not available from all companies.

5. General recommendations for improving fresh produce export quality

A. Improved harvesting practices

Potential market quality of any product begins at the time of harvest, or even before (Figure 15). Growers/exporters should be trained on the proper harvest maturity stage to pick those products destined for export. This can be done by on-site demonstrations and supplemented with written and well-illustrated guides on the specific external and internal product characteristics to use for determining proper harvest maturity stage. All products should be picked gently and during the coolest part of the day. This will help to reduce the amount of product bruising injury which occurs during picking. Once the product has been picked it should be removed from direct sunlight and kept in the shade in a well ventilated area. It is also very important to move the product from the field to the packingshed as quickly as possible.

Figure 15. Harvesting practices influence product market quality.

B. Better harvest containers

Harvest containers should always be lined with paper or some other soft, smooth material to prevent direct contact between the product and the rough bottom and sides of the container (Figure 16). The harvest container should also be strong enough to protect the contents inside and capable of being stacked without collapsing. The best type of harvest container is a square or rectangular rigid plastic container (Figure 17). Its smooth inner surfaces do not impart abrasion to the product and the material is strong, stackable, well ventilated, and easily cleaned. Growers should be made aware of the different types of harvest containers, their costs, and differences in the amount of product

damage they impart to the commodity. This can be accomplished by demonstrations and an illustrated technical brochure.

Figure 16. Bananas being packed in a strong paper-lined wooden crate.

Figure 17. High quality rigid plastic container used for mangoes.

C. Less product handling damage

Demonstrations on proper handling practices for produce should be provided to growers, collectors, and exporters in order to reduce the amount of bruising and physical damage incurred during movement of the product from field to packinghouse to airport (Figure 18). Emphasis should be placed on improving the handling practices during transport, unloading, washing, drying, packing, and stacking at the NGMC packinghouse. A concerted effort is needed to educate fresh

produce handlers on the importance of handling the product gently like eggs, instead of like hardware (Figure 19). This should be supplemented with strict supervision of the workers to ensure the product and cartons are treated gently.

Figure 18. Compression bruising of plantains during bulk transport.

Figure 19. Proper stacking and loading during transport to minimize product injury.

D. Improved postharvest sanitation

Use of the appropriate chlorine concentration in the wash water and maintenance of the proper water pH will be effective in reducing postharvest decay. The recommended chlorine concentration to use for wash water sanitation is 150 parts per million (ppm). Chlorine (bleach) is readily available in Guyanese supermarkets as a 5.25% sodium hypochlorite formulation [i.e. Marvex, (Figure 20)]. The exact amount of chlorine to add to obtain a 150 ppm solution depends on the wash tank volume. Adding 2.4 pints of 5.25% sodium hypochlorite per 100 gallons of wash tank

water will give a 150 ppm chlorine solution. (For smaller wash tanks, this is equivalent to adding 0.24 pints of 5.25% sodium hypochlorite per 10 gallons of water). Expressed in the metric system, this is equivalent to adding 3.0 liters of 5.25% sodium hypochlorite per 1000 liter wash tank water volume. (For smaller wash tanks, this is equivalent to adding 0.30 liters of 5.25% sodium hypochlorite per 100 liters of water).

Figure 20. Marvex bleach contains 5.25% sodium hypochlorite.

The pH of the water must be maintained between 6.5 and 7.0 for maximum effectiveness of the chlorine solution. If the water pH is above 7.0, it can easily be lowered by adding a small amount of vinegar or citric acid. If the water pH is below 6.5, it can easily be raised by adding a small amount of lye (NaOH).These additives are readily available in Guyanese supermarkets. The exact amount of material to add to the wash water tank depends on the initial water pH and the volume of the tank. Use of the recommended chlorine dose and wash water pH will do an excellent job of sanitizing the surface of produce.

As more produce items are added to the wash water, the chlorine concentration will decrease. This is the result of soil particles, dirt, debris, and the produce itself lowering the chlorine concentration over time. Therefore, if the same wash water is being re-used for extended periods of time, vigilant monitoring of the free chlorine level in the water is advised. Checks should be made at least on an hourly basis. Simple test strips and colorant test kits are available for determining chlorine concentration. Several water testing and chemical supply companies in the U.S. sell these chlorine monitoring devices (Hach, LaMotte; see Appendix B). Wash water pH can be checked using litmus paper and liquid test kits, but the simplest way is to use a digital pH meter which takes a direct an almost instantaneous reading of the water pH. Vendors of digital pH meters include Hach

and Cole-Parmer; see Appendix B). The water pH should also be checked at the same time as the chlorine is monitored.

Recommendations for future GEO Project activities include providing training and technical assistance to exporters and NGMC packinghouse personnel on proper sanitation practices, chlorine monitoring, and water pH measurement.

E. Better packaging

It is recommended to introduce export market-preferred packaging materials into Guyana for the principal fruits and vegetables currently being exported (Figure 21). Using these representative packages, the local packaging manufacturer (Caribbean Containers) will have a template to use as a basis for fabricating additional quantities of these packages. In order to increase the carton strength and likelihood of acceptable product arrival quality in the export destination, two-ply thickness and a minimum of 275 lb test strength is recommended for all future produce cartons. A cost analyses should also be made for domestically manufactured versus imported packaging materials from Trinidad, Jamaica, and the U.S.

Figure 21. High quality packaging needed for export markets.

F. Cooling and better temperature management

In the interest of the development of the Guyanese produce export industry, a cool storage room of sufficient capacity to meet the needs of the exporters should be added to the NGMC packinghouse. The recommended postharvest storage temperature for the vast majority of Guyanese produce exports is about 55°F (12.5°C). Lower temperatures are not necessary since the vast majority of fruits and vegetables exported from Guyana are tropical in nature and subject to

physiological chilling injury at storage temperatures below 55°F. However, the positive impact (in terms of less deterioration and postharvest decay) of holding fresh produce at 55°F instead of 75°F or higher (i.e. ambient temperatures) is significant.

Product cooling may be accomplished using several different techniques, but the most appropriate for the majority of Guyanese exporters and the NGMC packinghouse is a room cooling system. Room cooling involves placing well ventilated field or shipping containers of product in an insulated room equipped with refrigeration units and allowing cool air to circulate over the product . Cool air from the evaporator coils circulates around the containers and gradually cools the product. Typically, cool air is blown horizontally just below the ceiling, sweeping over and down through the containers of the product below. High air velocities around the containers are required to minimize the length of time required for cooling. After reaching the desired product temperature, airflow should be reduced to ~15 cubic ft / min to minimize product dehydration. A high relative humidity (~85-90%) inside the cool storage area is also recommended. Cartons should be stacked loosely to provide exposure to cool air.

6. Recommendations to improve the infrastructure and operations of the NGMC packinghouse

Although the building currently being used as the NGMC packinghouse is not ideal, it serves the purpose of facilitating exports of Guyanese perishables to Barbados and Antigua. However, a number of changes are recommended for improving the current NGMC packinghouse building and operations. In most cases, they are relatively easy and quick to implement and generally will not require large expenditures of capital (with the exception of the cool storage room). The changes will significantly improve the postharvest handling practices, export market preparation and quality of the fresh produce commodities. They will also improve worker efficiency and increase the speed and quantity of product handled through the facility.

These suggested changes involve modifications in the design and structure of the building, improvements in wash water sanitation, reconfiguration of the drying tables, alterations in internal building space utilization, changes in product flow, and adjusting the work schedule of the phytosanitary inspectors to meet the needs of the exporters. The suggested timeframe for making the recommended changes is as soon as possible and ideally within the next several months. The costs have been estimated for making each of the suggested improvements. The cost figures are given in U.S. $ and are based on figures given following communication with public and private sector officials, local merchants, and U.S. equipment vendors. The cost figures should be considered only as estimates, but are useful for budget planning purposes.

Schematic diagrams of the current packinghouse (Figure 22) and the recommended structural/design changes to improve the packinghouse (Figure 23) are included in order to help conceptualize the changes.

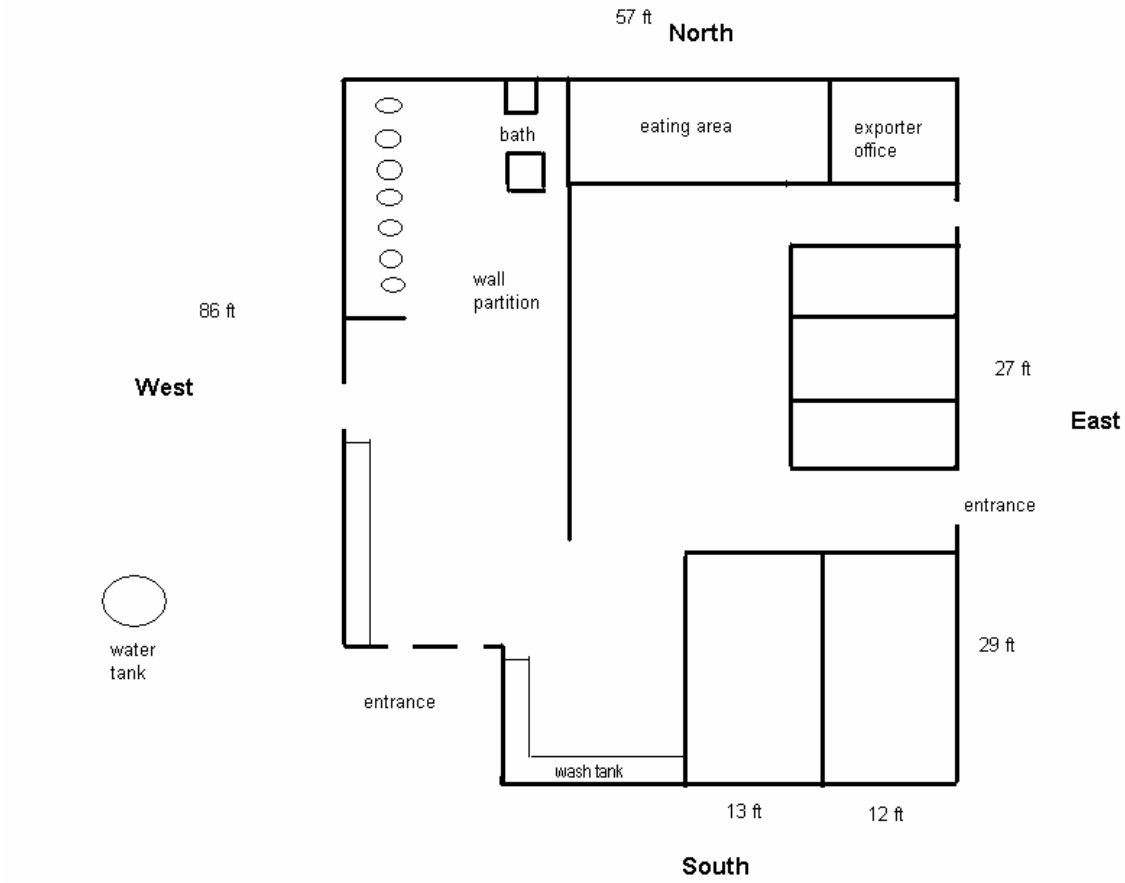

Figure 22. Schematic diagram of current NGMC packinghouse.

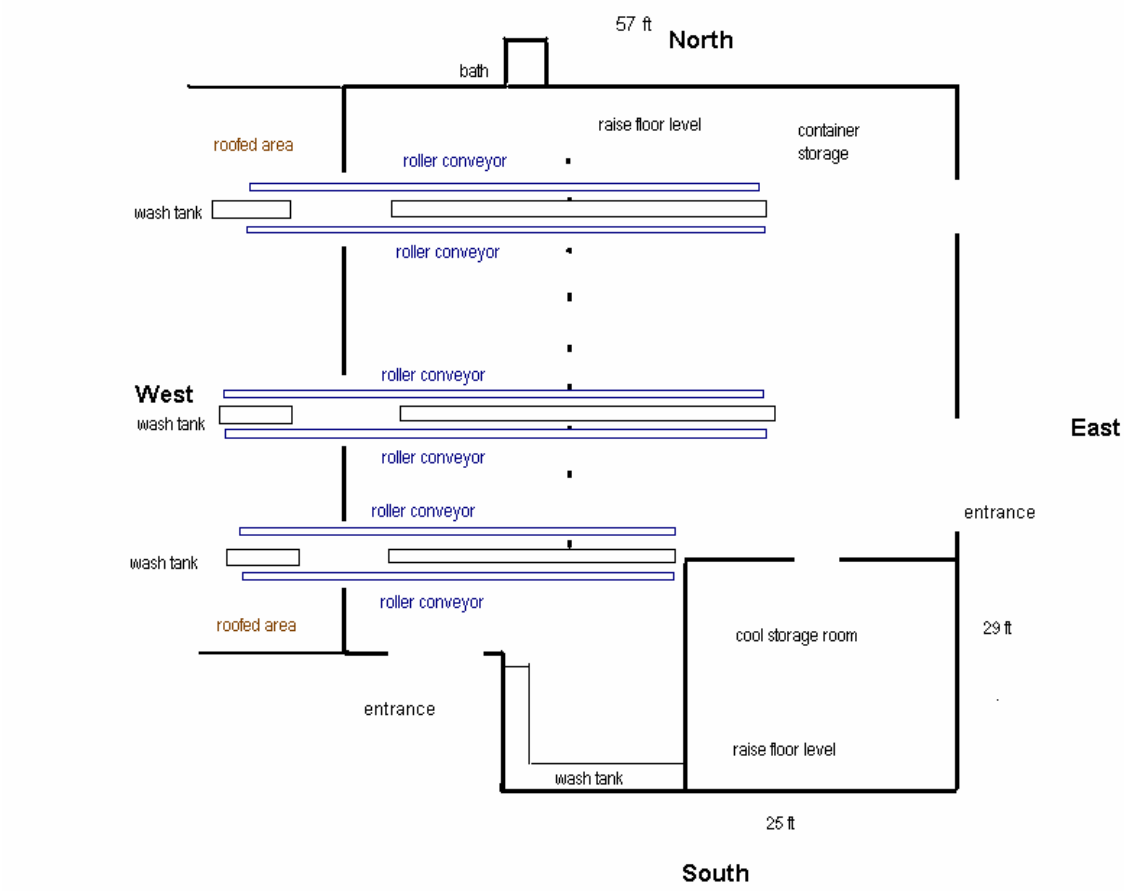

Figure 23. Schematic diagram of recommended structural/design changes to improve the NGMC packinghouse.

The recommended changes in building design, structure, and space utilization will necessitate a change in product flow from the present situation. Basically, it is recommended to have the truck unloading and washing area located on the western side of the building. After washing, the product should be moved along roller conveyors to drying tables positioned in an east-west direction inside the building. Following drying, the product should be packed and the cartons moved by roller conveyor to the cool room located in the southeastern corner of the packinghouse for overnight storage. The following morning, the cartons should then be moved by roller conveyor (or pallet jack) from the cool storage area and loaded onto the trucks destined for the airport.

A description of the suggested changes to the NGMC packinghouse follows. The order of priority for implementation of the specifically recommended changes was ranked from 1 to 18, based on need, ease of accomplishing, and cost.

1) Add more lighting

The light level inside the building is dim and not conducive to efficient packing or product inspection. Therefore, more fluorescent lights should added to reduce eye strain and worker fatigue. At least 12 more light ballasts should be hung throughout the packinghouse, with emphasis on the areas used for inspection and packing. The cost for adding the additional lighting is estimated to be $600.

2) Provide more ventilation to facilitate product drying and improve worker comfort

The produce should be dried as soon as possible after washing. This will allow for quicker removal of the product from the drying tables for packing. Essentially, this will result in more volume of product moved through the facility and less time to finish the overall packing operations. In order to speed up the rate of drying, either ceiling fans or portable horizontal fans can be used. However, the horizontal fans generally have a higher air displacement capacity and are more effective in drying. It is recommended to use one high capacity horizontal fan per drying table. Ideally, it should be adjustable for fan speed and rotation. In addition, at least 4 ceiling fans should be installed in the packing areas to improve worker comfort. The cost estimate for adding the fans (assuming 6 horizontal and 4 ceiling fans) is $800.

3) Adjustment of work schedule of phytosanitary inspectors

Government authorities from Barbados and Antigua have agreed to allow Guyanese plant health inspectors to certify the phytosanitary quality of the export-destined produce. However, they normally work only during daytime hours until about 6:00 p.m. This puts a lot of pressure on the exporters to finish unloading and cleaning their products for inspection before the inspectors leave. In order to be more accommodating to the exporters, it is recommended that the official hours of work for the inspectors be changed to noon until 8:00 p.m. on Mondays. Currently, this is the only day of the week in which the NGMC packinghouse is heavily utilized. Product from the exporters

typically arrives in the packinghouse in mid-afternoon, so there is little need for inspection services during the morning hours.

4) Procure an additional weighing scale

Currently, the NGMC packinghouse has two scales for weighing the produce. One is a very old style scale which uses movable weights on top of the scale to obtain the weight. This is a slow an efficient process. The other scale has a more modern needle-arm display and is easier and quicker to read the weight. In order to facilitate product and carton weighing, it is recommended to procure an additional top-loading scale. The maximum weight range should be about 500 pounds, with a resolution of ±1 pound. Either a digital display or needle-arm display is acceptable. The estimated cost is similar between these two styles of scale, and is approximately $800.

5) Open a larger entrance on the southwest corner of the building

Currently, there are two door openings on the southwest corner of the building. Neither is wide enough to facilitate efficient unloading of product from the delivery truck into the packinghouse. The wall partition separating the two doors should be removed, thereby creating a wide enough opening to efficiently unload. Delivery trucks could be backed up into the corner of the building, which would be useful during periods of rain.

The estimated cost for this building renovation procedure is $750.

6) Dismantle and remove the 7 brick structures in the northwest quadrant of the building

These structures occupy valuable internal packinghouse space and serve no purpose. After removal of the obstructions, this will create valuable space that should be used for drying and packing. The estimated cost for dismantling and removing the brick structures is $700.

7) Remove the inside wall partition extending from the bathroom area parallel to the western wall

Removal of this wall partition will create more open space inside the building. Of course, it will be necessary to leave an appropriate amount of support pillars inside the building to support the roof. The estimated cost for removing the inside wall partition is $800.

8) Reconfigure drying tables

Reconfiguration of the drying tables is recommended to facilitate better drying of the produce following washing. The tops of the metal-covered tables (which collect water and have no perforations for drainage) should be re-finished. The metal tops should be removed and replaced with a durable smooth plastic mesh or screen that is perforated for ventilation. This will speed up the drying process, as it will allow for air flow from the bottom of the table surface up through the pile. Water will never accumulate on the surface of this semi-open table, which will help reduce

postharvest decay. If the perforated plastic or screen material is not rigid enough, it may be necessary to nail small wooden laths or cross-pieces from underneath in the direction perpendicular to the length of the table to add rigidity and increase structural strength of the table top.

Along with reconfiguring the existing drying tables, it is recommended to obtain or build additional tables to provide more drying space. This will increase the packing volume capacity and allow for a quicker turn-around period between product washing and packing. It is recommended to additional drying tables totaling 100 feet in length (of similar width and height to the existing tables). The additional tables should be positioned in an east-west direction and put in the northwest quadrant and center part of the packinghouse as new space is created following the suggested changes noted in items #6 and 7. The estimated total cost for reconfiguration of the existing drying tables and procurement of the new tables is $900.

Orienting the drying tables in an east-west direction throughout the inside of the buildings will allow for more efficient flow of product from the washing area to the drying tables. It will also allow easy movement of the packed cartons into the cool storage area. The drying tables should be parallel to each other and be spaced far enough apart (i.e. at least 6 feet) to allow for ease of access and product movement. Workers should be positioned on both sides of the drying tables for packing the products into the export cartons.

9) Add roller conveyors to facilitate product movement

There is currently too much handling, carrying, and use of manual labor during the packinghouse operations. Significant improvements in worker efficiency and materials handling may be realized by adding more roller conveyors to the packinghouse operations. Specifically, roller conveyors should be used in each of the following steps to facilitate product movement and reduce manual handling:

- unloading of product from the truck into the cleaning/washing area
- movement from the wash tanks to the drying tables
- movement of the packed cartons/packages to the cooling/storage area
- loading of the packed cartons/packages onto the trucks destined for the airport

Movable roller conveyors on wheels are recommended. This will allow for the use of the same conveyor for several of the different packinghouse processes. For example, once unloading is finished, the same conveyor can be used to move the product from the wash tank to the drying tables. Likewise, the same conveyor used for moving the packed cartons to the cooling/storage area can be used the next morning to reverse the product flow from the storage area onto the truck.

For maximum efficiency of product movement, there should be a roller conveyor positioned on each side of all actively used drying tables, running along the entire length of the table. The height of the conveyor should be set at a level accommodating to the workers, and is typically between 2 to 2.5 feet. It is recommended to procure a sufficient number of roller conveyors to have for the entire length on both sides of 4 different drying tables. This amount should be sufficient to

accommodate all the steps in product movement inside the packinghouse. The estimated cost for proving the additional roller conveyors is $1,500.

10) Clean up outside area on the west side of the building and add wash tanks

The area just outside the building on the entire west side should be cleaned and resurfaced (i.e. with cement or brick). The existing water tank and support structure should also be removed. This area should then be used for unloading, product preparation, and cleaning. A roof should be built as an extension from the building to cover part of this staging area. The cost for cleaning up the area and extending the roof is estimated at $3,000.

A second bridge over the drainage area parallel to the asphalt road should be built to allow truck entrance into this area. Part of the existing fence surrounding the property will have to be taken down to allow for this bridge. The estimated cost for this additional access area is $300.

Wash tanks should be located in this area, underneath the new roof, in case of rain or inclement weather. The wash tanks should be made of stainless steel, fiberglass, or should be tile-lined troughs. At least 3 different wash tanks areas should be constructed. This will allow for simultaneous washing by 3 different exporters. Each was tank should be of large enough size to accommodate the needs of the exporter. This will typically be in the range of about 500 gallons, but it is recommended to have partitions in each tank to divide it into smaller sections for accommodating lesser product volumes, if necessary. The wash tank water level should be at a comfortable height for the workers (typically around 2.5 feet high) with a width of about 3 feet and length of about 15 feet per tank. Washing of the produce in this area will make the flow of product through the packinghouse much more efficient. It will also free up existing inside space for drying and packing. The estimated cost for the 3 wash tanks is about $2400.

Currently, the water supplied to the packinghouse is shut of from about noon until 4 p.m. This is the most critical demand time. Concerted efforts should be made in cooperation with the Guyana Water Authority to have a continuous supply of water available to the packinghouse, especially on the busy Monday afternoon time period. If this is not possible, at least three large storage tanks (~500-gallon capacity) should be procured and used to supply water when the city water supply is turned off. The tanks should be elevated to a height of 15-20 feet to provide adequate pressure for gravity feeding of the water to the wash tanks nearby. Either hoses or PVC pipe can be used to transfer the water from the storage tanks into the wash tanks. The estimated cost of the 3 water storage tanks and support structures is $1200.

To facilitate movement of the washed product into the packinghouse, the wash tanks should be positioned in a perpendicular direction to the western wall of the building. This will allow for smooth and direct flow of the product either by conveyor or manually into the packinghouse. Cleaning and draining of the wash tanks in this area will not interfere with other packinghouse operations.

11) Open larger entrance ways on the west side of the building

Presently, there is only one door on the west side of the building. This will not be enough access space to the building once the items in #10 are completed and in operation. After the washing process is completed, the product will need to be moved inside the building for drying, inspection, and packing. Therefore, it is recommended to remove part of the existing western wall of the building to create wider openings for product movement. Three entrance ways of approximately 8 feet wide should be made along the western side of the building. The entrances should be spaced roughly equidistant, with one in the center and the other two near the ends along the west side. After these renovations to the west side of the packinghouse are made, it is recommended to stage all the product unloading, cleaning, and washing in this area. Therefore, the use of the entrance in the southwest corner of the building (item #5) will be phased out. The estimated cost for this building renovation procedure is $1500.

12) Dismantle office space along the east side of the building

The three office partitions located on the east side of the building should be removed to create more open space for packinghouse operations. They can be relocated to the building next door, just a short distance away. According to NGMC staff, availability of office space in the adjacent building is not a constraint. In addition, the exporter's office should be relocated to the same adjacent building. The walled partition separating the exporter's office from the eating area should be removed. This would free up additional space in the northeast corner of the building for carton assembly and temporary storage. The estimated cost for this renovation is $1000.

13) Dismantle the 2 bathrooms inside the building on the north side

The 2 bathrooms located inside the building should be dismantled to provide additional packinghouse space. However, a single new unisex bathroom should be built just to the outside of the north wall of the building. The same septic tank as is used now can accommodate this new bathroom position. The door to access the external bathroom should be located inside the packinghouse along the north wall. It is not deemed necessary to have two separate male and female bathrooms. The estimated cost for this renovation is $1500.

14) Fill in the sunken floor areas with concrete to establish a uniform floor height

Several areas inside the building have sunken floors relative to the level in other parts of the building. This includes the north end, the southeast, and much of the eastern half currently covered with a slatted wooden floor. In order to facilitate efficient product movement and the use of pallet jacks, it is recommended to fill the sunken areas of the floor with concrete. Slatted wooden floors are not recommended as they may provide refuge for undesirable insects. In addition, the organic debris falling through the cracks is difficult to remove and may provide shelter to postharvest disease organisms.

The estimated cost to fill in the sunken floor areas is $1500.

15) Repair leaks in roof

Although previous roof repair was done following take-over of the building by NGMC, there still are some remaining areas that leak. These should be patched as soon as possible. The severity of the roof leaks were not able to be judged, as it did not rain during the times this consultant was present in the building. However, this was a problem mentioned by both the exporters and the public sector staff who use the facility. If the amount of water leaking through the roof is severe, it impinges on space utilization, affects worker productivity, damages cartons, and adversely affects the quality of the product.

A cost estimate for roof repair cannot be given, since the extent of the leakage was not observable in the absence of rain.

16) Open a larger entrance on the east side of the building to facilitate truck loading

Currently, there is only one door opening on the east side of the building for loading trucks destined to the airport. This opening should be widened to about 15 feet to accommodate the simultaneous loading of two trucks. The bridge or small access road extending from the packinghouse to the road parallel to the packinghouse should also be widened to accommodate two trucks backing up to the packinghouse. The estimated cost for creating a wider loading entrance is $500.

17) Procure pallet jack to facilitate movement of packed cartons

Movement of cartons can be very efficient if they are stacked on a pallet. Depending on the carton size, a pallet may hold between 30-100 cartons. The entire pallet unit can then be lifted and easily moved with a hand-operated pallet jack. This will require a smooth and level floor. Procurement of a pallet jack is recommended for the future, as soon the quantity of exports increase to justify the expense. The estimated cost for the pallet jack is $1000.

18) Add cool storage room

It is recommended to use the southeast corner of the packinghouse for cool storage. Presently, this area is not utilized and the space is taken up by two storage rooms separated by a wall. This inside wall should be removed, which will then result in a cool storage area of approximately 25 ft wide x 29 ft long. This will be sufficiently large to accommodate all the produce currently being exported to Barbados on Tuesdays. It will also provide excess cool storage capacity to accept additional export volume as the industry expands. The entire room floor should be filled with cement or concrete in order to raise it to the same level as the floor inside the building. The walls and ceiling of the room should also be insulated with Styrofoam or polyurethane (2-inches thick) to preserve the cool temperature inside and reduce the refrigeration load.

The cool storage room should be equipped with sufficient refrigeration capacity to accommodate the anticipated product volume. A cooling system with at least 10 tons of refrigeration

capacity (120,000 BTU/hr) is recommended for the NGMC packinghouse. This is a sufficiently large system to meet the current export volume needs. It can be increased in capacity as the export volume expands. The cool storage room should be maintained at 55°F.

Refrigeration capacity is expressed in either BTU's or tons of refrigeration. One ton of refrigeration equals 12,000 BTU/hr. (This is equivalent to about 3.4 kilowatts of refrigeration). Tonnage of mechanical refrigeration capacity (or BTU's) needed for cool storage rooms can be estimated by using the following formula:

Pounds of product x desired temperature reduction (in °F) divided by 12,000.

An additional 25% should be added to this figure to allow for removal of heat from product respiration, carton and worker heat, and leakage of cool air from opening the cooler entrance door. The total figure is the number of tons of refrigeration capacity required per hour. For example, to cool 4000 lbs. of plantains to 55EF from a pulp temperature of 75EF:

4000 lbs product x 20EF (75EF to 55EF) = 80,000) 12,000 = 6.7 tons of refrigeration
Add 25% to 6.7 tons = 8.4 tons of refrigeration per hour

The cost for a new mechanical refrigeration unit is about $1500 per ton in the U.S. This is also the estimated cost in Georgetown, and includes installation at the NGMC packinghouse (personal discussion with ECI Engineering Co.).

In order to facilitate the smooth flow of product in and out of the cool storage area, a door opening about 10 ft wide in the center of the room is recommended. This will easily accommodate a pallet jack and a person moving through the opening simultaneously. Plastic strips should be hung on the inside of the doorway to minimize warm outside air from entering the cool room when the door is open. Movement of product in and out of the cool storage room should be planned to minimize the time the entrance door is open. Ideally, a horizontal sliding door hung on rollers should be installed, although a hinged door opening to the outside is acceptable. The existing doorway should be walled off.

The estimated cost and source for the materials needed to convert the existing southeast corner of the packinghouse into a cool storage room include:

- Insulation material
  - 2-inch thick Styrofoam or polyurethane to cover all 4 sides and ceiling = $1,000
- Refrigeration unit
  - 10-ton (120,000 BTU/hr or 34 kilowatts) capacity cooling system = $15,000
- Plastic door stripping = $200
- Sliding door = $600

7. Comparison of available versus alternative packing facilities

The NGMC packinghouse in Sophia is currently the only centralized facility available for exporters to Barbados and Antigua. There are no other alternative public or private sector operated produce packing facilities. Therefore, it is important for the development of the Guyanese produce export industry to make the recommended improvements in the existing facility. If funds become available in the future for construction of a new packinghouse facility, this would be ideal. However, NGMC and other public sector officials interviewed indicated this is unlikely to happen, at least for the next several years.

Interviews with air cargo personnel indicated at least one company was thinking about the construction of a packing and cool storage facility on their site at Cheddi Jagan airport. This is contingent on obtaining sufficient cargo volume to justify the investment. Another air cargo operator is planning on positioning one or more refrigerated 40-foot marine containers at their site for temporary cool storage.

The ideal situation for the Guyanese produce export industry would be the construction of one or more packinghouses near the principle sites of fruit and vegetable production. Logical locations include Parika and Charity. The packed produce could then be transported directly to the airport. However, this would be contingent on the phytosanitary inspectors from Barbados and Antigua approving these locations for packinghouses. Availability of cool storage near the airport would also be beneficial to the perishables industry. This would help maintain the postharvest quality of the fresh product during the inevitable flight delays and cancellations.

If funds were to become available in the future for the construction of one or more packinghouses near the principle sites of production (e.g. Parika, Charity), the cost would likely be considerably higher than renovating the existing NGMC facility in Sophia. Any alternative packinghouse facility should contain similar space and infrastructure to that recommended for the NGMC facility. Therefore, these costs would be much higher than those of the existing NGMC facility, because much of the infrastructure at the Sophia site is already in place. In addition, the cost of the building, road improvement around a new site, and access to water and electricity would all be additional costs to construction of new packinghouse site.

A. Costs to exporters

The end result of making all the suggested packinghouse improvements will be a much better facility capable of serving the needs of the existing exporters and allowing for additional exporter expansion. The NGMC should increase the user fee to the exporters for use of the improved facility. Prior to establishing the current NGMC packinghouse, the 3 exporters sending product to Barbados were individually paying $200 per week for the Barbadian inspector to come to Guyana and certify the produce. Currently, the exporters are assessed a lower rate of approximately $10 (2,000 Guyanese dollars) per week for use of the packinghouse.

The exact amount of increase in the user fee should be based on the total costs made for the

improvements, in addition to upkeep and maintenance. A compromise should be made in which both the NGMC (i.e. Guyanese government) and the exporters share the costs for improvements. A reasonable suggestion would be for the NGMC to provide funds for half the costs of the improvements and the exporters would be responsible for paying the other half.

8. Workshop presentation.

An informal workshop was lead by the consultant to present his findings and discuss the current constraints in postharvest handling, packaging, and transportation that impede exporting of Guyanese fresh fruits and vegetables. Approximately 30 individuals from both the public and private sector participated in the workshop. The audience consisted of growers, collectors, exporters, packaging company representatives, air and sea transportation representatives, Ministry of Fisheries, Crops and Livestock officials, researchers, chemical company representatives, and Go-Invest officials. Recommendations were given on how to improve many aspects of the current postharvest handling system in order to be able to supply the export market with a higher quality product. The key issues facing the export market development of the fresh produce sector were addressed and possible solutions were identified.

Appendix A. Persons /Organizations Interviewed

Public sector:

Tom Whitney, GEO Project Director; GEO office, 12 Earl's Avenue, Subryanville

Nizam Hassan, Deputy General Manager, New Guyana Marketing Corporation (NGMC); 87 Alexander Street, Georgetown

Minister Sawh, Minister of Fisheries, Crops and Livestock;
Regent Road, Georgetown

Geoffrey DaSilva, CEO Go-Invest; (Board Chairman NGMC), 190 Camp Street, Georgetown.

Dr. Leslie Munroe, Plant Health Unit, National School of Agriculture, Triumph Village

Victorme Kellman, Plant Health Unit, National School of Agriculture, Triumph Village

Dr. Odo Homenauth, Director
National Agricultural Research Institute (NARI); Triumph, East Coast Demerara

Mr. Mohammed Feroze, Post Harvest Specialist
National Agricultural Research Institute (NARI); Triumph, East Coast Demerara

Mr. Rajeshwar Persaud, Farming Systems Agronomist
National Agricultural Research Institute (NARI); Triumph, East Coast Demerara

John Clowes, Chief Crops and Livestock Officer, Ministry of Livestock, Crops, Fisheries; Regent Road, Georgetown.

Gordon Studebaker, GEO Project, private sector advisor

Private sector:

Collectors/Exporters:

Deodat Doodnauth, mangoes and mixed produce to Toronto (Kiskadee Importers), 39 First Street, Alexander Village, East Bank Demerara

Rankripaul and Doodnauth Singh, mixed produce to Barbados,
Two Brothers Canal No. 1, East Bank Demerara

Khimraj Ramkelowan, mixed produce to Barbados,
57 Station Street, Kitty

Bisram Singh, mixed produce to Barbados,
Two Brothers Canal No.1, West Bank Demerara.

Ms. Sursatti Morgan, mixed produce to Antigua
78 Courabane Park, Annandale, East Bank Demerara

Airfreight representatives:

Mr. Ulric Ceres, Managing Director; Amerijet International.

Harribhajan Persaud, President, Universal Airlines; 142 Regent Street, Georgetown

Oscar Phillips, General Manager; Laparkan Air and Sea Cargo.

Christine Dean, Cargo Manager, British West Indies Airlines
(BWIA), 125 Barrack Street, Kingston, Georgetown.

Mr. Junior Horatio, Sales and Marketing Manager, North American Airlines, Carmichael Street, Georgetown.

Seafreight representatives:

Mr. Frank Camacho, C & V Caribbean Shipping, 110 Laluni Street, Queenstown.

Clarence Perry, Marketing Executive; Laparkan Air and Sea Cargo Service, 2-9 Lombard Street, Werk-en-Rust.

Richard Doorgen, Maersk Shipping Co., 45-47 Water Street.

Others:

Zulfikar Samdally, Caribbean Container Inc., Farm, East Bank Demerara.

Jimmy Lorrimer, Caribbean Container Inc., Farm, East Bank Demerara.

Wayne Barakat, ECI Engineering Services, 108 Regent Street,
Bourda, Georgetown; refrigeration systems, metal fabrication.

Victor Pires, Managing Director; Caribbean Chemicals, 45 Croal Street, Stabroek

Amazon Chemicals, Georgetown

Harry Etwaroo, fish exporter, packaging.

Farmers in Parika area:

Mr. Lewis, pineapple.

Mr. Grimes, cassava, sweetpotato.

Mr. Suri Persaud, shallots, oranges, papaya, eddoe, plantain.

Ms. Chandra, grower / collector, plantain, eddoe, pumpkin.

Farmers in Pomeroon River area:

Mr. Azaad Ali, mango supplier to D. Doodnauth.

Ms. Vilma DaSilva, farmer and speedboat operator.

J. Harrop, farmer; mixed fruit, cassava.

Keith Rahim farm, largest citrus grower in Pomeroon River area.

Mr. I. Persaud farm, mixed fruit, cassava.

Mr. M. Persaud farm, coconuts and mixed fruit.

Ivor Allen farm, largest cash crop farm in area with 6000 acres under cultivation.

Wholesale markets:

Bourda; Stabroek; Parika; Mon Repos

Retail markets:

Fogarty's; Nigel's; GMC store

Appendix B. Sources of Materials for Further Development of Guyanese Produce Exports

Water chlorination and pH testing equipment/supplies:

Hach Company
P.O. Box 389
Loveland, Colorado 80539
Phone: 970-669-3050

LaMotte Company
802 Washington Avenue
Chestertown,| Maryland 21620
Phone: 410-778-3100
Fax: 410-778-6394

Hanna Instruments, Inc.
584 Park East Drive
Woonsocket, Rhode Island 02895
Phone: 401-765-7500
Fax: 401-765-7575

Cole-Parmer Instrument Company
625 East Bunker Court, Vernon Hills, Illinois 60061
Phone: 800-323-4340
Fax: 847-247-2929

Cooling systems:

ECI Engineering Services
108 Regent Street
Bourda, Georgetown

Grainger Export
2255 NW 89th Place
Miami, Florida
Phone: 305-591-2512
Fax: 305-592-9458

Barr Inc.
1423 Planeview Drive
Oshkosh, Wisconsin
Phone: 920-231-1711
Fax: 920-231-1701